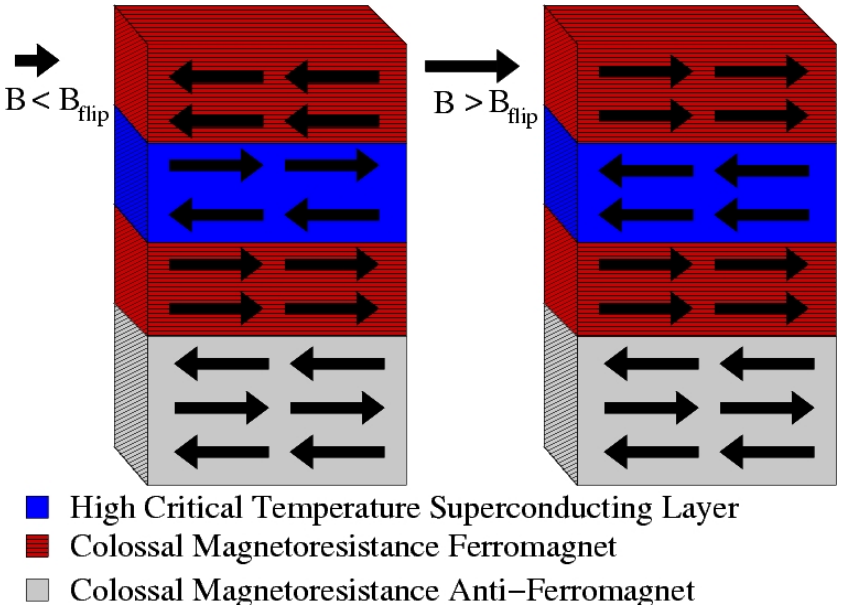
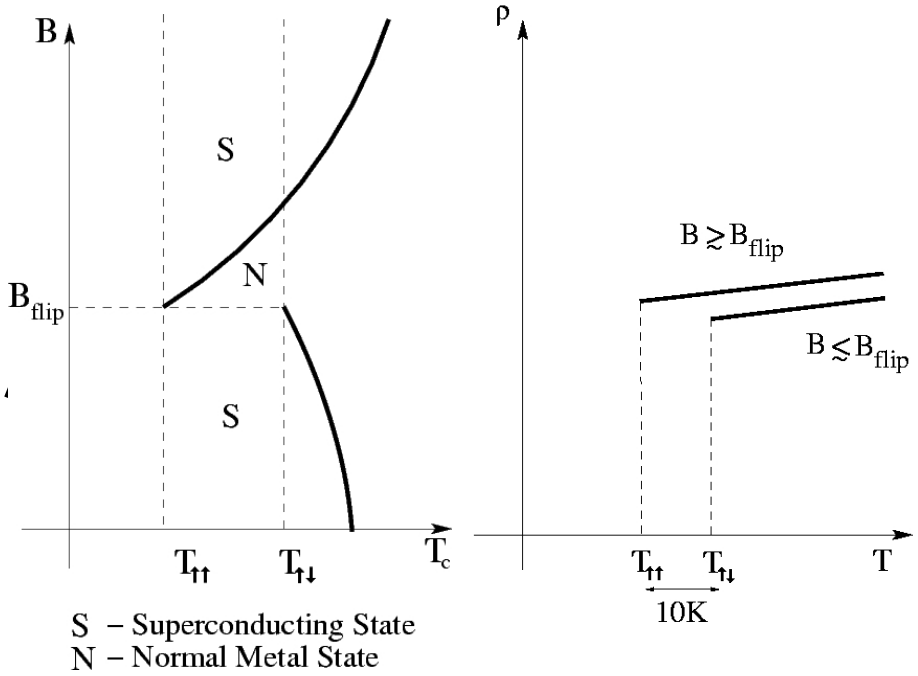
Interplay of Magnetism and Superconductivity at the Nanometer Scale (DMR-0304380)

C.A.R. Sa de Melo, Georgia Institute of Technology

We study the magneto-resistance of a single unit cell layer of superconducting material deposited between two ferromagnets. If the proper types of materials are used, superconductivity occurs at low temperatures when the ferromagnets are anti-aligned (Left Fig.). However, past a small critical applied field value, the ferromagnets become aligned (Left Fig.) and superconductivity disappears abruptly within a certain temperature range (Right Fig.). In this case the resistance of the system increases sharply and we have a **super-colossal magneto-resistance effect** (Right Fig.).





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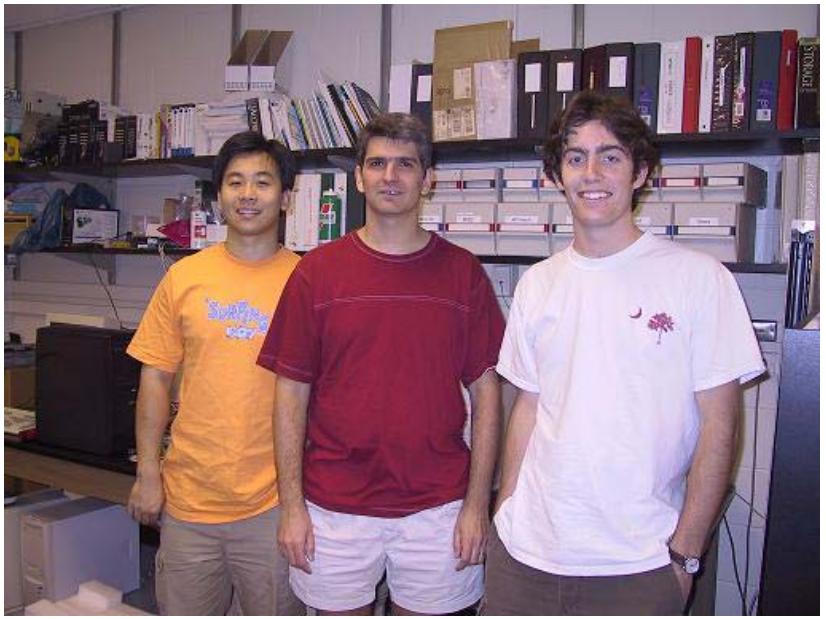
Education and Dissemination:

This NSF grant supports the research and education of two students. One graduate student (Wei Zhang, left) works on the interplay of antiferromagnetism and triplet superconductivity at the nanometer scale. One undergraduate student (E. Miles Stoudenmire, right) works on magnetoresistive effects in nanometer scale ferromagnet/superconductor multilayers (the work described in the previous page). Wei and Miles are presenting their research at the MMM, Gordon, and APS conferences. They have also submitted their work for publication.



From Left to Right: Wei Zhang (graduate student), C. A. R. Sa de Melo (PI), E. Miles Stoudenmire (undergraduate student).